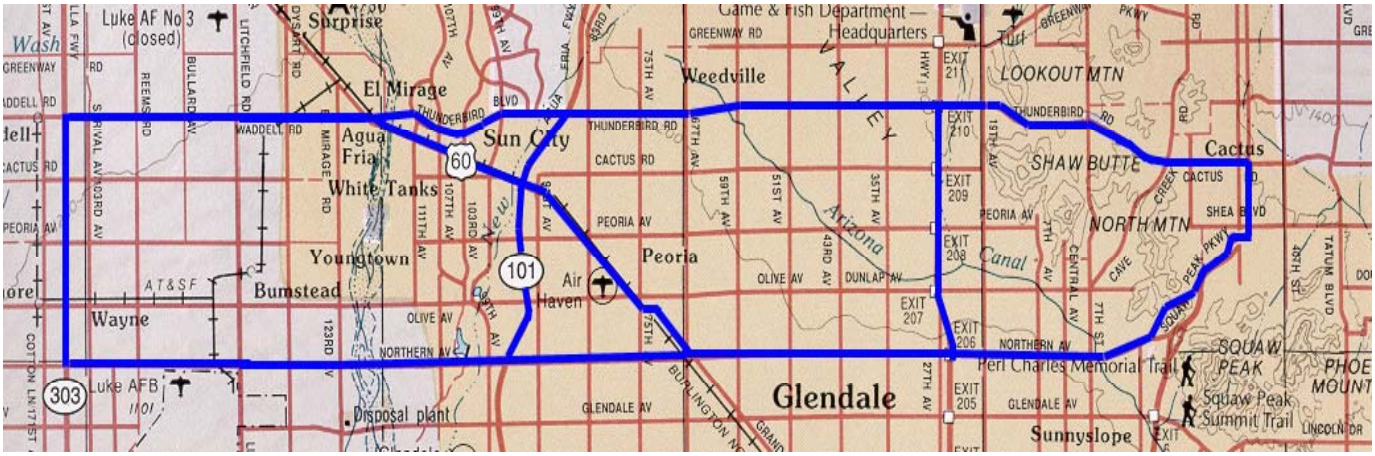
East-West Mobility Study

Working Paper # 5 – DRAFT
Alternatives Evaluation Criteria



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I. EXECUTIVE SUMMARY

The East-West Mobility Study (Study) is one element of the Maricopa Association of Government's (MAG) Regional Transportation Planning Process. The Study area is bounded by Thunderbird / Waddell Road on the north to Northern Avenue on the south; and Loop 303 on the west to State Route (SR) 51 on the east. The Study will assess options for east-west traffic flow improvements within the project area. The major criteria that will be evaluated are: environmental impacts, community impacts, mobility and level of service, alternative mode/facility compatibility, costs effectiveness, and stakeholder acceptance.

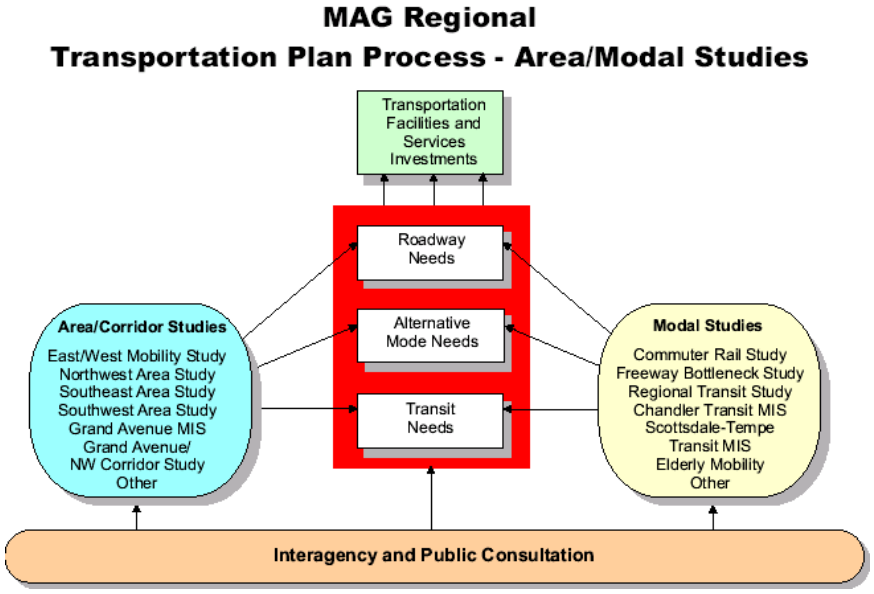
II. INTRODUCTION

This working paper is intended to establish the evaluation criteria for the transportation alternative packages that will be brought forth into an evaluation phase. The evaluation criteria developed is a product of the goals, objectives, and policy issues of the projects.

III. STUDY BACKGROUND

Maricopa County is expected to continue to experience major population increases and is forecast to grow from approximately 3.1 million in 2000 to 4.5 million in 2020. This expected growth is driven by migration from other states and immigration from Latin America. The Regional Transportation Planning Process is intended to address the increased demands associated with these population increases. The East-West Mobility Study is one part of the overall MAG Regional Transportation Planning Process. This process is shown in Figure 1.

Figure 1 – MAG Regional Transportation Planning Process



IV. STUDY AREA

The study area is bounded by Thunderbird / Waddell Road on the north to Northern Avenue on the south; and Loop 303 on the west to SR 51 on the east. Figure 2 shows a map of the study area.

V. OVERVIEW OF THE EAST-WEST MOBILITY STUDY PROCESS

The study will assess options for east-west traffic flow improvements within the project area and will include an assessment of current traffic demands and facility characteristics, estimates of future traffic demands, development of alternative East/West Mobility Strategy Packages, and a screening process that leads to a Preferred East-West Mobility Strategy Package. Evaluation criteria developed in this working paper will provide the foundation for selection of the preferred strategy package.

VI. PUBLIC INVOLVEMENT / COORDINATION

Public involvement opportunities will be provided throughout the decision-making process. The study also includes comprehensive agency and public involvement components to ensure active community and governmental agency involvement throughout the study process. Public meetings will be used to present study findings and to solicit public input on project issues, development of alternatives, and final east/west mobility recommendations.

VII. EVALUATION CRITERIA

Six evaluation criteria have been identified from the study process. These criteria originate from the goals, objectives and stated policy issues of the project. Several sub criteria have been developed for each of the main evaluation criteria that summarize the critical issues inherent to the main criteria. Many of the criteria can be quantitatively evaluated and are sensitive to changes in the transportation strategy packages.

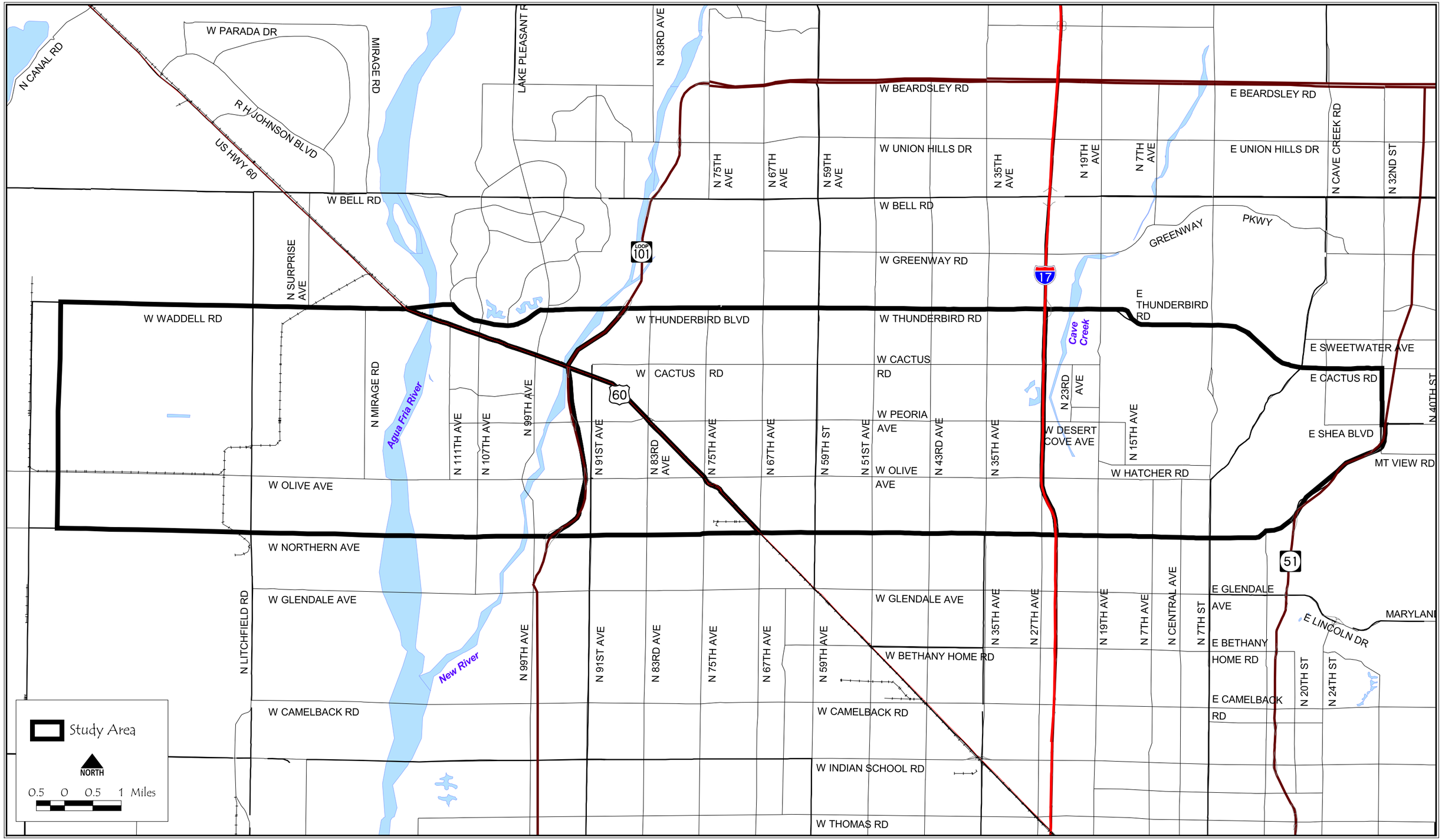
The number of criteria has been limited to ensure that the critical issues drive the evaluation process and result in a meaningful evaluation of the strategy packages. The evaluation criteria are presented in Table 1 below.

Table 1 – Evaluation Criteria

Potential Environmental Impacts
- Air Quality
- Transportation Noise
- Environmental Justice
- Business and Residential Relocations

Potential Community Impacts
- Neighborhood Cohesiveness
- Changes in Traffic Patterns

East/West Mobility and Level of Service
- Travel Time
- Vehicle Miles of Travel (VMT)
- Vehicle Hours of Travel (VHT)
- Total Delay
- Freeway LOS
- Intersection Congestion/LOS



This MAP is for general planning purposes only, and is subject to updates and changes. Any user should check with the Maricopa Association of Governments prior to the use to be sure that the data shown is current. Because of the scale of this map, any user should not rely on it for the exact definition of any boundary or division line shown on said map.

This MAP is based on information from numerous sources and the accuracy of which is not guaranteed by the Maricopa Association of Governments. The Maricopa Association of Governments is not responsible and shall not be liable to the user for damages of any kind arising from the data or information shown on this map.

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FIGURE 2:
Map of Study Area

East-West Mobility Study

Alternative Mode / Facility Compatibility
- Regional Connectivity
- Alternative to SOV Trips

Costs and Cost Effectiveness
- Capital Costs
- Cost Effectiveness

Stakeholder Acceptance
- Local Governments
- Public

Each of the above evaluation criteria represents the important issues relevant to the stakeholders, thus, relating the goals and objectives of each stakeholder with the evaluation process. Considerations and establishment of rating attributes for each evaluation criteria are discussed below. The three developed strategy/alternative packages will be compared against the existing MAG Long Range Transportation Plan (i.e.; the base case scenario). However, prior to discussing these methods, the general scoring process is discussed.

General Scoring Process

The scoring process will be based on a matrix form that does not prejudge the relative importance of the evaluation criteria relative to each other. This allows an unbiased evaluation specific to the evaluation criteria issues. The process will involve assigning a positive, neutral, or negative attribute to each evaluation criteria for each strategy package based on performance as discussed below. This process will be applied to each of the study segments within the study area. Table 2 provides an example of the evaluation process.

Table 2 – Example Scoring Process

Evaluation Criteria	Package #1	Package #2	Package #3
Potential Environmental Impacts	**1**	**2**	**3**
Air Quality	+	+	O
Transportation Noise	+	-	O
Environmental Justice	+	+	+
Business and Residential Relocations	-	O	-
Potential Community Impacts	**3**	**2**	**1**
Neighborhood Cohesiveness	O	+	+
Changes in Traffic Patterns	-	-	+
East/West Mobility and Level of Service	**2**	**1**	**3**
Travel Time	+	+	O
Vehicle Miles of Travel	+	+	O
Vehicle Hours of Travel	-	O	-
Total Delay	O	+	O
Freeway LOS	O	+	-
Intersection Congestion/LOS	-	O	-
Alternative Mode / Facility Compatibility	**3**	**2**	**1**
Regional Connectivity	-	-	+
Alternative to SOV Trips	O	+	O
Costs and Cost Effectiveness	**2**	**1**	**3**
Capital Costs	-	O	O
Cost Effectiveness	+	O	-
Stakeholder Acceptance	**2**	**1**	**3**
Local Governments	O	+	-
Public	O	+	O

+ = Positive attribute 0 = Neutral attribute - = Negative attribute

Potential Environmental Impacts

Air Quality: Travel demand model output for the three strategy packages will provide an objective measurement of air quality. Air quality is typically addressed in detail at the design concept stage. The regional travel demand model output will be considered to assess possible differences among transportation packages.

Transportation Noise: The level of highway noise depends on three things: (1) traffic volume, (2) traffic speed, and (3) number of trucks. Traffic noise model look-up tables, developed by the Federal Highway Administration, will be utilized to predict noise levels on the arterials or arterial segments of the base case and strategy packages. These estimates are not as accurate as project level modeling, but allow comparison among

transportation alternatives. Different criteria will be used for residential areas versus commercial area

Application of the rating factors will be based on the following considerations:

- Strategy packages that reduce the projected transportation noise over the study area as a whole relative to the base case will receive a positive attribute.

- Those resulting in no change will receive a neutral attribute.

- Strategy packages that increase the projected transportation noise will receive a negative attribute.

Environmental Justice: The East-West Mobility study is intended to provide improved mobility for the traveling population as a whole. Analysis of the strategy packages and base case for disproportionately high and adverse effects on Title VI populations will consider the following two elements (1) the potential offsetting benefits to the affected minority or low-income populations, and (2) the relevant number of similar existing transportation system elements in non minority and non low-income areas.

Application of the rating factors will be based on the following considerations:

- Strategy packages that have offsetting benefits and maintain the existing relative balance of transportation elements in all population areas relative to the base case will receive a positive attribute.

- Those resulting in similar conditions will receive a neutral attribute.

- Strategy packages that have potentially disproportionately high and adverse effects without realizing offsetting benefits will receive a negative attribute.

These evaluation criteria will also be assessed within the Stakeholder Acceptance evaluation via the public involvement process. Further, it will be considered in the Potential Community Impacts of Neighborhood Cohesiveness and Changes in Traffic Patterns.

Business and Residential Relocations: Minimizing the number of relocations required not only reduces individual and community disruption, it also reduces capital costs associated with transportation improvements. The four potential improvement components involving possible relocation actions are: major roadway widening projects; new grade separated intersections; major intersection improvements; and construction of new transit centers, park-and-ride lots, and other such facilities.

The first two can be quantified fairly simply and accurately. Relocations for major widening projects can be quantified using a linear measurement (miles) of proposed roadway to be widened. To provide better resolution, these linear measurements can be broken into two categories, residential and commercial. This method will not directly quantify the number of properties to be relocated, however, it will give a direct comparison between the strategy packages and the base case.

The measurement of major intersection improvements and new grade separated intersections with respect to property relocations is somewhat more difficult to assess, as it is more dependent on the work to be performed and the configuration of the properties in the area. However, by multiplying the number of major intersection improvements by 0.10 miles the unit of measure remains the same for both components and direct comparisons that reflect the potential impact can be made.

Application of the rating factors will be based on the following considerations:

- Strategy packages that have lower total miles of relocation relative to the base case will receive a positive attribute.

- Those resulting in similar conditions will receive a neutral attribute.

- Strategy packages that have higher total miles of relocation will receive a negative attribute. New transit centers or other major site facilities proposed in the strategy packages will have to be based on the specifics of proposed locations to make the comparison meaningful and will be factored into the rating as necessary.

Potential Community Impacts

Neighborhood Cohesiveness: Neighborhood cohesiveness can mean many different things to many different people. However, neighborhood cohesiveness generally is a function of the daily interactions between people. A neighborhood is related to and a part of a larger community. While on one hand each neighborhood should have its own identity or distinction to set it apart from all others, it is also a part of a larger whole. Within a neighborhood acts such as looking after each other's children, borrowing and lending items, and sharing emotional good times and bad are typical products of neighborhood cohesion. Physical elements that restrict these daily interactions and introduce an inconvenience, or increase the time required to access others in the neighborhood could disrupt neighborhood cohesiveness.

Application of the rating factors will be based on the following considerations:

- Strategy packages that do not introduce new physical barriers (i.e., major widening projects) through existing neighborhoods relative to the base case will receive a positive attribute.

- Those resulting in similar conditions will receive a neutral attribute.

- Strategy packages that introduce new physical barriers will receive a negative attribute.

Changes in Traffic Patterns: Changes in existing or planned traffic patterns can create both positive and negative impacts in a community. Elements such as reduction in cut-through traffic are a positive change in traffic patterns. Conversely, creation of cut through traffic potential is negative. Strategy package elements that improve residential and business access are a positive change in traffic patterns while those worsening access are a negative change. There are many other factors with similar bi-polar

impacts and the elements considered will be dependent on the components of the strategy packages.

Application of the rating factors will be based on the following considerations:

- Strategy packages that provide positive changes in traffic patterns relative to the base case will receive a positive attribute.

- Those resulting in similar conditions will receive a neutral attribute.

- Strategy packages that introduce negative changes in traffic patterns will receive a negative attribute.

East/West Mobility and Level of Service

Travel Speed: Travel speed can be defined as the average speed of traffic traversing a given segment of roadway. These travel speeds can be obtained for arterials or arterial segments (i.e.; one-way lengths) within the study segment via the travel demand model. Actual arterials or arterial segments to be analyzed will depend on somewhat on the components of the strategy packages. However, regardless of the make up of the strategy packages, the analysis emphasis will focus on improvements of east/west travel flow or mobility.

Application of the rating factors will be based on the following considerations:

- Strategy packages that increase the travel speed in the east/west direction without hampering north/south travel relative to the base case will receive a positive attribute.

- Those resulting in similar conditions will receive a neutral attribute.

- Strategy packages that decrease the travel speed in the east/west direction will receive a negative attribute.

Vehicle Miles of Travel (VMT): Vehicle mile of travel is the product of all traffic volumes on a typically average weekday times the length of roadway in miles. In an urban setting, changes in VMT can effect air quality, congestion, and maintenance and operating costs. In general, reduction in VMT has a positive benefit on the aforementioned and many other factors.

Vehicle miles of travel is specific to a given roadway or roadway segment. Further, this variable can be readily obtained from the travel demand model. The aggregate VMT of all arterials within the study area, for each strategy package will provide a sound indication of the benefits and drawbacks of the various packages.

Application of the rating factors will be based on the following considerations:

- Strategy packages that reduce the VMT relative to the base case will receive a positive attribute.

- Those resulting in similar conditions will receive a neutral attribute.

- Strategy packages that increase the VMT relative to the base case will receive a negative attribute.

Vehicle Hours of Travel (VHT): Vehicle hours of travel is the product of all traffic volumes on a typically average weekday times the length of time it take to traverse the roadway in minutes. In an urban setting, changes in VHT will have an effect on air quality and congestion. In general, reduction in VHT has a positive benefit on the aforementioned and many other factors.

Vehicle hours of travel will be examined on a system wide basis. Further, this variable can be readily obtained from the travel demand model. The aggregate VHT of all arterials system wide for each strategy package will provide a sound indication of the benefits and drawbacks of the various packages.

Application of the rating factors will be based on the following considerations:

- Strategy packages that reduce the VHT relative to the base case will receive a positive attribute.

- Those resulting in similar conditions will receive a neutral attribute.

- Strategy packages that increase the VHT relative to the base case will receive a negative attribute.

Total Delay: Total delay is the cumulative number of hours of delay of all traffic volumes on a typically average weekday traversing all roadways within the Phoenix metropolitan area. In an urban setting, changes in delay can have an effect on congestion. In general, reduction in delay has a positive benefit.

Total delay will be examined on a system wide basis. Further, this variable can be readily obtained from the travel demand model. The aggregate delay of all arterials system wide for each strategy package will provide an indication of the benefits and disadvantages of the various packages.

Application of the rating factors will be based on the following considerations:

- Strategy packages that reduce the total delay relative to the base case will receive a positive attribute.

- Those resulting in similar conditions will receive a neutral attribute.

- Strategy packages that increase the total delay relative to the base case will receive a negative attribute.

Freeway Level-of-Service (LOS): Freeway level-of-service (LOS) will be equated to a Volume over Capacity (V/C) ratios generated by the travel demand model. The following freeways will be examined and compared: SR 5, I-17, and Loop 101. Level-of-service

over “E” will be considered negative or failing and tabulated by segment to compare with other alternatives.

Freeway LOS will be examined on freeway segment within the study area. This variable can be obtained from the travel demand model. The LOS of freeway segments of each strategy package will provide an indication of the benefits and disadvantages of the various packages.

Application of the rating factors will be based on the following considerations:

- Strategy packages that reduce the number of failing freeway segments relative to the base case will receive a positive attribute.
- Those resulting in similar conditions will receive a neutral attribute.
- Strategy packages that increase the number of failing freeway segments relative to the base case will receive a negative attribute.

Intersection Congestion/Level-of-Service (LOS): Intersection congestion or level-of-service (LOS) will be generated by the travel demand model. Major intersection on the east/west corridors will be examined and compared to the base case. Intersection level-of-service over “E” will be considered negative or failing and tabulated by alternative.

The number of intersection with a LOS of “E” or worse will be tabulated for the study area. The LOS variable can be obtained from the travel demand model. The intersection LOS of each strategy package will provide an indication of the benefits and disadvantages of the various packages.

Application of the rating factors will be based on the following considerations:

- Strategy packages that reduce the total number of failing intersections relative to the base case will receive a positive attribute.
- Those resulting in similar conditions will receive a neutral attribute.
- Strategy packages that increase the total number of failing intersections relative to the base case will receive a negative attribute.

Alternative Mode / Facility Compatibility

Regional Connectivity: Connectivity is a critical component in the success of alternate travel modes. Without connectivity between modes and service providers the full potential of alternative transportation is not realized. Further, coordination between the candidate modes and the needs of the people it serves is of paramount importance.

In other words, the best combination of alternative transportation modes and traditional improvements will only be practical and cost effective if the combination serves the needs of the population. For instance, a population with a significant percentage of elderly persons may not benefit extensively by increasing the number of on-street bike lanes. Conversely, the addition of on-street bike lanes in areas where employment and

residence are within close proximity of each other may be very effective. Simultaneous analysis of the considered modes, their effectiveness in meeting needs, and the interactions between these modes is the root of successful regional connectivity.

Regional connectivity will be subjectively analyzed with respect to connectivity between the various modes and service providers based on the practicality of service provided. Application of the rating factors will be based on the following considerations:

- Strategy packages that increase connectivity relative to the base case will receive a positive attribute.

- Those resulting in similar conditions will receive a neutral attribute.

- Strategy packages that decrease connectivity relative to the base case will receive a negative attribute.

Alternative to Single Occupancy Vehicle (SOV) Trips: Alternative modes of transportation that take the place of single occupancy vehicle trips can reduce both congestion and pollution. However, provision of a large number of alternative mode types does is not necessarily "better" if the practicality and the utilitarian nature of the candidate modes do not meet the needs of the populations.

Application of the rating factors will be based on the following considerations:

- Strategy packages that include a greater number of practical alternatives to SOV trips relative to the base case will receive a positive attribute.

- Those resulting in similar conditions will receive a neutral attribute.

- Strategy packages that reduce the number of alternatives to SOV trips will receive a negative attribute.

Costs and Cost Effectiveness

Capital Costs: Cost and cost effectiveness will be analyzed separately. However, relating the anticipated cost with the anticipated benefits of the expenditure will only enhance the consideration of these criteria. Capital costs will be calculated and analyzed to be as consistent as the MAG Long Range Transportation Plan projected costs.

Cost Effectiveness: Cost effectiveness will relate the calculated costs and the environmental, community, alternative mode, and mobility/level of service factor rankings. Establishing the rating attribute for the cost effectiveness criteria may not necessarily be based on the summed rank of the environmental, community, alternative mode, and mobility/level of service factors. Other consideration factors could be vehicle mile of travel (VMT) and population. Clearly, high rankings in all performance factors for a given strategy package with a low cost would indicate superiority. However, it is likely that consideration of the cost effectiveness will not be clear cut and will require analysis of the benefits provided by the performance factors as a whole with trade off considerations between the performance factors.

Stakeholder Acceptance

Local Governments: The resulting dialog from upcoming forums that detail the strategy packages will be major factor in determining stakeholder acceptance for each package. Application of the rating factors will be based on the following considerations:

- Strategy packages that receive generally favorable responses from the Forum participants will receive a positive attribute.

- Those receiving neutral or marginally negative responses from the Forum will receive a neutral attribute.

- Strategy packages that receive a negative response from the Forum participants will receive a negative attribute.

Public: Similar to the local government acceptance, public acceptance of the strategy packages will be measured based on feedback obtained through the public information meetings. Application of the rating factors will be based on the following considerations:

- Strategy packages that receive favorable responses during the public involvement process will receive a positive attribute.

- Those receiving neutral responses will receive a neutral attribute.

- Strategy packages that receive negative responses from the public involvement process will receive a negative attribute.

VIII. MODEL OUTPUT REQUIREMENTS

Evaluation of the strategy packages will require certain outputs from the travel demand modeling process. In addition, similar outputs will be needed for the base case scenario. These include:

- Total Delay in hours for primary arterials
- Level-of-Service or Volume/Capacity Ratios for primary arterials
- Traffic volumes for primary arterials
- Average travel speeds for primary arterials
- Vehicle Miles of Travel (VMT) for the primary arterials and,
- Vehicle Hours of Travel (VHT) for the primary arterials.

The following identified specific arterials will require output information for evaluation of each strategy package:

- Waddell Road/Thunder Bird Road from Loop 303 to SR 51
- Cactus Road from Loop 303 to SR 51
- Peoria Avenue from Loop 303 to SR 51
- Olive Avenue from Loop 303 to SR 51
- Northern Avenue from Loop 303 to SR 51
- Loop 303 from Waddell Road to Northern Avenue

- Sarival Avenue from Waddell Road to Northern Avenue
- Reems Road from Waddell Road to Northern Avenue
- Litchfield Road from Waddell Road to Northern Avenue
- Dysart Road from Waddell Road to Northern Avenue
- El Mirage Road from Waddell Road to Northern Avenue
- 107th Avenue from Waddell Road to Northern Avenue
- 99th Avenue from Thunder Bird Road to Northern Avenue
- Loop 101 from Thunder Bird Road to Northern Avenue
- Grand Avenue from Thunder Bird Road to Northern Avenue
- 91st Avenue from Cactus Road to Northern Avenue
- 83rd Avenue from Thunder Bird Road to Northern Avenue
- 75th Avenue from Thunder Bird Road to Northern Avenue
- 67th Avenue from Thunder Bird Road to Northern Avenue
- 59th Avenue from Thunder Bird Road to Northern Avenue
- 51st Avenue from Thunder Bird Road to Northern Avenue
- 43rd Avenue from Thunder Bird Road to Northern Avenue
- 35th Avenue from Thunder Bird Road to Northern Avenue
- I-17 from Thunder Bird Road to Northern Avenue
- 19th Avenue from Thunder Bird Road to Northern Avenue
- 7th Street from Thunder Bird Road to Northern Avenue

If travel characteristic data (traffic volumes, average travel speeds, delay, level-of-service, VMT, and VHT) cannot be disaggregated for the specific study area identified, we will use the entire Phoenix metropolitan area travel statistics and rank each of the applicable evaluation criteria by the relative difference between alternative package.

Base Case: The base case that will be used is the currently adopted Maricopa Association of Government's Long Range Regional Transportation Plan. This Transportation Plan will be the basis or benchmark for comparison to all alternatives developed.